Digitized by the Internet Archive
in 2018 with funding from
University of Toronto

https://archive.org/details/medjournalMay1930uoft

THE UNIVERSITY OF TORONTO MEDICAL JOURNAL

(An Undergraduate Publication)

This journal is published seven times a year, November to May, by the Medical Society of the University of Toronto, to serve as a medium for student expression and to bring to the student recent articles of scientific interest.

EDITOR-IN-CHIEF,
F. G. Kergin, B.A., 3T0.

ASSOCIATE EDITORS,
W. A. Hawk, 3T0. C. A. Wicks, B.A., 3T0.

ASSISTANT EDITOR, C. G. Stogdill, M.A., 3T1.
MANAGING EDITOR, E. G. Harkness
WOMEN'S EDITOR, Miss Miriam Brick, 3T0.

YEAR REPRESENTATIVES.

S. G. Shier, 3T0. A. N. Jackson, 3T1. G. P. Hamblin, 3T2.
D. Telford, 3T3. J. D. F. Bailes, 3T4. W. Rutherford, 3T5.

With Advisers from the Staff of the Faculty of Medicine.

Address all communications to Room 107, Medical Building.

Volume VII TORONTO, MAY, 1930 Number 7

EDITORIAL.

At this occasion, the final issue of the Journal under the present editorship, we wish to thank those members of the faculty who have contributed papers to the Journal during the past session. As editors, we realize the maturity which these papers give to our humble publications, and as students we are aware of their value as representing the conclusions gained from extensive clinical experience. We are sure that the students who have written articles for publication have gained a great deal in the preparation of those papers, and we remind the student body again that one of the chief values of this Journal is to serve as a means of student expression.

We have been very unfortunate in being deprived of the services of our Editor-in-Chief during the latter part of the session.

Mr. C. G. Stogdill, M.A., will become Editor of the Journal after the summer vacation. Mr. Stogdill has acted as Assistant Editor during the present session, and has ably demonstrated his ability in that capacity.

Mr. D. W. Johnstone of 3T2 has been appointed Assistant Editor for the coming year. He has engaged with success in various activities in previous years and will no doubt have similar success with the Journal.

Next year we hope to appoint one of the associate editors from the fourth year and thereby obtain closer touch with the junior years.

Address to the Graduating Year.

By Dr. H. B. Van Wyck.

Mr. Toastmaster, Members of the Graduating Year,—

I did not expect so effulgent an introduction from your President, but I prepared for his well-known rhetorical tendency last night, when, at the Burnside, I, like you, was acting as Chairman—of a reception committee to another taxpayer. In the early hours of the morning I wrote a piece of poetry. It appeared good at first, although by the gray dawn light it seemed to have lost some of its distinction, and, until just now, I had decided to suppress it as a monstrosity and regard it as stillborn. But to-night I bring it forth again as a defence-offering to propitiate those unseen powers who grow hostile when a lacking sense of humor is displayed.

Here is the poetry—just four lines:

"I lay last night in a toastmaster's bed
With never a toastmaster by,
And I said to myself, as I lay down my head,
How easily toastmasters lie."

You have done me the honor of inviting me here to enjoy your hospitality, and to contribute what I may of comment, advice and prophecy on this important occasion.

Were I older I might escape a merited censure if I tendered you advice, for advice comes best from him who is more mature, whose life is more varied and complete; were I younger I might happily assume the role of prophet, for youth sees visions—old men dream dreams—and youth has no faith in the validity of dreams. Safer ground for me merely will be to note what thoughts occur to me as I attend again a banquet of the final year of Medicine.

You are passing an important milestone on life's roadway. You all began the journey some years ago with a minimum of equipment, and up to the present you have been adding to it. In the earlier hours of your lives your training was largely personal, physiological experiment, and your researches, carried on in the smallest and greatest laboratory of the world—the cradle—were supervised, and, alas! only partially controlled, each by a fond female, whom you had the good fortune to appropriate immediately after the completion of the second stage of labor. Your choice of this female, research co-worker, was based not on her scientific qualifications, happily in this case, but because of family influence and, shall we say, a process resembling what the biologist knows as graft. This choice, you see, was purely a matter of sentiment and accident. Your life and hers had become strangely united. But I need not warn you that when you take on your staff the next most important female coadjutor, as all of you may and the most of you will, you must struggle against influence, eradicate sentiment, and obtain the necessary credentials. Your first choice of the weaker sex, however, was a success. This privileged creature you permitted to provide you with the material for the dietetic problems you immediately began to work upon, and, judging from your present appearance, you found this material good.

Your scientific progress at this stage was unimpeded; the apparatus was cheap and simple: a bottle, superimposed upon which was a gutta percha contrivance with a minute perforation, and a number of pieces of vestment each 18" square. Butter Soup was not your medium. Your progress was rapid. Experiment succeeded experiment, sometimes even into the wee small hours of the morning. You

mastered as young gastro-enterologists, the normal.

In other departments, too, you made rapid strides. After some weeks, with pardonable pride, each of you succeeded in getting your big toe into your mouth—and that was not the last time you succeeded in putting your foot in it. Achievement was piled on achievement. Paternal guidance gave place at an early age to tuition by the State. Presumably she undertook to make you articulate and accurate, to be able to read, write, and add. That these elements in your education were threatened with extinction by the multitude of fads in our primary education, by the enthusiasm of the protagonists of child psychology, who are in danger of forgetting that the child is to be taugtht as well as studied; by those who apparently prefer that a child shall become an amateur biologist, an amateur painter, an amateur musician, a precocious dilettante rather than that he shall spell and use words correctly and add with precision—that under this system you received your primary education was not your fault; let us be thankful that by illiteracy you did not pay the cost of versatility.

The highway of life, still hedged about by your elders, led straight to the open doors of our University, where technical training was given you. That a university should and does mean more to you than that, you have found out; if you have, you have found here not merely a training for the practice of medicine, but a training for life.

But now at graduation the narrow highway becomes broadened out and divides, its branches spreading out to the widening horizon. Already, as you approach this milestone, your eyes are eagerly peering the distance. With feelings of both elation and trepidation you are gazing into the world ahead of you, judging now as men what you saw, not as youths and children.

It does not behoove us to place what value there may have been in the training you received in our faculty. We cannot deny the fact that we think it the best of all medical schools. What does one learn in every medical school?

You have been taught to know—have you learned wisdom? You have been taught to learn—have you learned to think? You have learned to observe—can you see? You can feel—can you have compassion? You have been taught accuracy—have you learned to be kind? You have learned the value of truth—have you lost the love of beauty? You know justice—are you tolerant?

You are about to solve the riddle of the Sphinx; you will spend the rest of your lives solving it: What is this world into which you plunge, and what is the meaning of your lives and of life itself?

May I, who have progressed just a little ahead, return to the threshold of this new world you are entering, and with you note to-day what a world it is?

If you search the record of the wisest men, you will be struck at the note of pessimism in their survey of contemporary life. Sages and saints are apt to be severe, it is true; apt to take a gloomy view of the society in which they live, and to prognosticate evil in it. But we must admit that their prognostications are apt to turn out to be right. Plato's account of the wise, gifted and brilliant community of the ancient world of that Athens of his, to which we owe so much, is despondent enough. "There is but a very small remnant," he says, "of honest followers of wisdom, and they who are of these few and who have tasted how sweet and blessed a thing is wisdom, and who can fully see, moreover, the madness of the multitude, and that there is no one, we may say, whose action in public matter is sound, and no ally for whatever would help the just." "What," asks Plato, "are they to do?" "They may be compared," says Plato, "to a man who has fallen among wild beasts; he will

not be one of them, but he is too unaided to make way against them, and, before he can do any good to society or his friends, he will be overwhelmed and perish uselessly. When he considers this, he will resolve to keep still and mind his own business, and he will endure to behold the rest filled with iniquity, if only he himself may live his life clear of injustice and impurity and depart when his time comes, in mild and gracious mood, with fair hope."

Plato's picture of democratic Athens is dismal enough. We may be sure that his contemporaries, for the most part, would have pronounced it overcharged. Had we been living then, we would have thought things were going well with Athens, and yet in a few years came the collapse and the end of Athens as an independent State. Plato was right; the majority were bad and

Let us turn to a British sage, a man whose works you should read, the greatest intellectual force of Victorian England—Thomas Carlyle. And here I should like to confess to you that, of all the books which have survived to enrich life, I find in Carlyle the greatest intellectual pleasure and stimulus. Let me recommend to you "Sartor Resartus," if you would learn more of life; "The French Revolution," if you would understand more clearly world politics and the political motives that control the destiny of peoples; and "Past and Present," if you would learn to understand social problems. What was Carlyle's estimate of contemporary life? "At this time," says he, "while there is a cry everywhere, articulate or inarticulate, for an 'Aristocracy of Talent,' a Governing Class, namely, which did govern, not merely which took the wages of governing and could not with all our industry be kept from misgoverning, corn-lawing, and playing the very deuce with us—it may not be altogether useless to remind some of the greener-headed sort what a dreadfully difficult affair the getting of such an Aristocracy is! Do you expect, my friends, that your indispensable Aristocracy of Talent is to be enlisted straightaway, by some sort of recruitment aforethought, out of the general population; arranged in supreme regimental order, and set to rule over us? That it will be got sifted, like wheat out of chaff, from the Twenty-seven Million British subjects; that any Ballot-box, Reform Bill, or other Political Machine, with Force of Public Opinion never so active on it, is likely to perform said process of sifting? Would to Heaven that we had a sieve; that we could so much as fancy any kind of sieve, wind-fanners, or ne-plus-ultra of machinery, devisable by man, that would do it!

"Done, nevertheless, sure enough, it must be; it shall and will be. We are rushing swiftly on the road to destruction, every hour bringing us nearer, until it be, in some measure, done. The doing of it is not doubtful, only the method and the costs! Nay, I will even mention to you an infallible sifting process whereby he that has ability will be sifted out to rule among us, and that same blessed Aristocracy of Talent be verily, in an approximate degree, vouchsafed us by and by; an infallible sifting process, to which, however, no soul can help his neighbour, but each must, with devout prayer to Heaven, endeavour to help himself. It is, O, friends! that all of us, that many of us, should acquire the true eye for talent, which is dreadfully wanting at present! The true eye for talent presupposes the true reverence for it—O Heavens, presupposes so many things!"

You will see that Carlyle deplores the impotency of the wise man. To him the failure of his age was the lack of reverence for the wise man, for the hero. If Plato and Carlyle were here to-day, how would our world appear to them? They would see a world in whom, to the many, materialism was a religion, and a multitude whose faith had gone out. They would see a business world developed, in which knavish

tricks were only dishonourable when they were found out; and then only a matter for a sly smile when bail could be arranged.. Would they see a greater reverence for wisdom? Is Shaw too cynical when he says: "Considering that we poisoned Socrates, crucified Christ, and burnt Joan of Arc amid popular applause, because after a trial by responsible lawyers and churchmen we decided they were too wicked to be allowed to live, we can hardly set up to be judges of goodness or to have any sincere liking for it."

And I am quite sure that certain phases of our modern life would afford the sages of the past much amusement. For example, our daily Press, with its transparent partisanship, its unreliability, its hysterical exaggeration. They would read in one daily that the people's choice of governor is a super-man; in the other daily, a moron. They would not be edified by long circumstantial accounts of crime, in which not only the leading characters were paraded in nauseous detail, but where those only casually connected with the incident were drawn into more prominence tthan that given the discovery of "insulin."

A few nights ago the 'phone rang: "The Daily Rail and Slampire speaking. Do you know, Doctor, anything about the discovery not yet announced from McGill?"

I said: "Sorry, I don't."

"Well, Doctor, do you think it is going to be good for puerperal sepsis?"

I said: "There is a sound principle I always attempt to carry out: not to arrive at conclusions until I have obtained some data."

"Well, Doctor, what do you think we can publish about it?"

I said: "Why, publish anything. Reduce the size of your paper; you would find it much easier on you. We have stacks of newspapers in the cellar, and Christmas season is past and we are well supplied with wrapping papers."

I should dearly like to hear the comments of Carlyle on Hollywood. He would write in this wise: "Tremendous investment of capital, throngs of badly-educated, over-paid puppets, and the result is the intellectual pabulum of the masses. Two-legged automatons, with rare gastronomical efficiency, and all other appetites sharpened except that one indispensable appetite, without which, flourish and strut as they may, these foolish ones ride to the edge of the abyss and disappear into outer darkness, viz., the appetite to speak wisdom and do it; a dervish dance before the camera which bids fair to lead into it the simple ones among the people; but not for long—untruths, unwisdoms, quackisms aided by the Supreme Quack, may come and have their day, but, in this, God's World, will always arise to meet these the whirlwind which will sweep them away into the subterranean realm of scoundreldom, and there leave them to reap what they have sown.

"In the meantime, O my friends, what have we to suffer? Croesus and he of the asses' ears combining for our enlightenment."

To quote Horace: "The mountain is in labor and there is born a silly little mouse."

The artistic value of the product of all this is nil, and yet it has driven from the stage in great part the dramatic heritage of our race.

The radio, an agent for the spread of good, is too often one for the propagation of what is vulgar, foolish and inane. In the common life of the people, the sage would see, just as of old, the worship of the golden calf, quackery, from which we as a profession suffer; insincerity, and all the kindred of materialism. Again, what defense have we for the anarchy, social injustice and violence in the world, what Plato has called the "Madness of the Multitude"?

If we have what Carlyle called the eye for wisdom, we must deplore all this, and yet perhaps we can point to the other side of the picture proving that even our civilization, imperfect

as it is, is a step forward. In that province of human activity to which we have devoted our lives, achievements beyond the dreams of the past have been won, and this is true in all the sciences.

In statesmanship, there has insensibly crept into the councils of the nations a feeling of world responsibility that transcends the narrow limits of class and nationalism.

In education, there has never in the history of the world been afforded to the common man an equal opportunity to rise from the drudgery of toil to the life of the intellect and soul. Social legislation has been making progress for the betterment of the underprivileged. All this has been accomplishel slowly, and by what Plato calls the remnant—those who have had eyes to see and ears to hear, and who have learned to love wisdom. It is a large remnant now, and you, gentlemen, are of it.

To adjust yourselves to the world, and bear your place in it and your function, not only to make your living, but live your life, you must, with care and zeal, have the right scale of values. You can do no better than to return to the old Greek ideal, which was that although the material world had its place in the life of man, his highest good was the life of the intellect or soul. The pursuing of the true, the beautiful and the good, was the thing. To waste our time of life, which is all too short, and miss the good of the world, the beauty and truth of it, is suicide. Your work is ennobling; keep your play on high intellectual levels. What your attitude will be to the various concrete problems of today, social, political, religious, I cannot advise you; but meet these problems you must, and if you have learned wisdom, as Plato meant it, have learned to value intellect above gain, ideas above stocks and bonds, beauty in nature, art and man above material possessions and sensual enjoyments, you will have invested your lives well and receive increasing dividends.

And this, gentlemen, will ultimately solve all the world's problems.

May I close by wishing you all success and God-speed.

Injuries to the Knee Joint.

By D. W. G. MURRAY, M.B., F.R.C.S. (Eng.).

Morphologically, the knee-joint in the human race is the result of many factors, not the least of which is the erect posture and the necessity for maintaining equilibrium through two vertical structures by means of muscle tone. Four-footed animals have a much simpler problem as regards their knee-joints; also birds, etc., while having only two legs, have in addition a broad base for each leg in the form of a long-toed foot in the ground birds, and a grasping foot in the perching ones. Moreover, most of these creatures have the knee joint closer to the trunk and have developed a tarsus or metatarsus to increase the length of the leg . The human femur is relatively long, placing the knee-joint approximately midway between the trunk and ground where it is at a disadvantage, especially from external forces.

It is an extraordinary piece of anatomy, placed at such a disadvantage, that provides excellent support and still has such a range of movement. To assemble the bones of the hip-joint or ankle-joint, the most casual observer could see possibilities of stability with a very ordinary arrangement of ligaments and muscles; but to examine the

bones of the knee-joint, or try to arrange ligaments or muscles to provide free movement in flexion, and stability in extension, would be a difficult task.

The special structure of the knee-joint, developed from a triple joint as seen in the Platypus, is an interesting study, and its function is equally interesting. These details may be obtained from any one of many books, and mention will be made here of only a few of the more interesting points. The ligamentum mucosum is the remains of the division between the patellar joint above and the two tibio-condylar joints below. The crucial ligaments represent the lateral ligaments of the originally separated tibio-condylar joints. The lateral and crucial ligaments are all strong structures, and are specially concerned in the stability of the joint. The internal lateral ligament runs downward and forward. It is taut on full extension, and on account of its direction, it prevents external rotation of the tibia. The external lateral ligament runs downward and backward, and, being taut on full extension, also resists external rotation. The anterior crucial ligament runs upward, backward and outward, is taut on full extension, and so resists internal rotation of the tibia. The posterior crucial ligament runs upward, inward, and forward, and prevents internal rotation of the tibia. Therefore, the two lateral ligaments prevent external rotation of the tibia, and the two crucials prevent internal rotation when all are taut as in full extension. So, with the shape of the condyles of both femur and tibia, these bind the two bones firmly together, and provide a rigid structure during full extension. Furthermire, the knee-joint has developed a special reflex which throws the controlling muscles very rapidly into action in an attempt to prevent abnormal movements. With a knowledge of the anatomy of the knee-joint, the pathology resulting from an injury to the knee joint may be conveniently classified into:

Internal Derangements.

1. Sprains.
2. Rupture of lateral ligament—internal.
3. Rupture of lateral ligament—external.
4. Rupture of crucial ligament—anterior.
5. Rupture of crucial ligament—posterior.
6. Dislocations.
7. Rupture of semilunar cartilage—internal.
8. Rupture of semilunar cartilage—external.
9. Loose body.
10. Osteochondritis dissicans.
11. Trauma to retropatellar pad of fat.
12. Fracture of spine of tibia.

Other Injuries.

1. Traumatic synovitis of prepatellar bursa.
2. Fracture of patella.
3. Rupture of patellar tendon.
4. Fracture of one or both condyles of tibia.
5. Fractures of one or both condyles of femur.

Sprains of the knee joint vary from very trifling injuries providing only minor disability and requiring no treatment, to quite severe lesions with a good deal of pain, disability, and synovial effusion, lasting many days. The pathology of these lesions is represented by minor tears in any one or several of the ligaments of the joint, resulting from exaggeration of one of the movements beyond its normal limits. A localized hemorrhage and effusion into the joints are the results. Direct injury, such as a bump on the knee, may produce a similar lesion, and may be called traumatic synovitis, or, if the retropatellar pad of fat is involved, it produces a tender swelling on each side of the patellar tendon, limiting full extension. A short period of restricted movement, as provided by a pad of absorbent and an elastic bandage, with probably some counter irritation, will provide a sense of support

and reduce the swelling in both conditions.

When the injuring force is greater, the sprain is very rapidly replaced by a more or less complete rupture of one or more of the ligaments. The commonest of this type of injury is a rupture of the internal lateral ligament. The structure of the joint makes it impossible to tear any one of the ligaments by indirect injury to them, without throwing great strain on the others, and usually several of the ligaments are injured at the same time. If the injuring force cease when the internal lateral ligament is ruptured, the crucial ligaments are stretched, but may avoid rupture, and vice versa. Force applied to the outer surface of the leg or thigh may cause this injury, and many of the cases come from the football field, as well as from industrial and other accidents.

The pathology of this condition shows a rupture of the ligament usually near its attachtment to the internal condyle of the femur, with a tear of the synovial membrane and a haemarthrosis. Occasionally a fragment of bone is torn off the femur at the point of attachtment of the ligament. The symptoms following immediately upon the injury, are severe pain for a short period over the ruptured ligament, worse on movement or weight-bearing, and swelling of the whole joint appearing within a few hours. Physical examination shows the joint distended with fluid, with swelling and marked tenderness over the internal condyle of the femur, and lateral instability, which means that with the knee in full extension there is lateral movement at the joint.

Rupture of the external lateral ligament is less common, chiefly because it is less frequently exposed to indirect force. It presents a clinical picture somewhat like the former, except that lateral instability in this case allows the foot to be displaced toward the mid-line of the body.

Crucial ligament injuries rarely occur alone, but are accompanied by rupture of either the internal or external lateral ligaments, much more commonly the former, and consequently are a much more serious lesion. Force continuing after rupture of either of the lateral ligaments may rupture one or both of the crucial ligaments, more commonly the anterior. This force may be applied in a transverse direction, or in the nature of hyperextension, or severe torsion, etc.

The pathology is that of ruptured ligaments with a haemarthrosis, and not infrequently the anterior crucial ligament may tear off a small fragment of bone at its attachment to the tibia.

The symptoms of pain, dysfunction and swelling follow immediately on the injury. The physical findings are deformity in many of the cases, with the tibia apparently slipped forward on the femur and the whole joint distended with fluid. There is more or less hyperextension, and in this extended position, the tibia can be slipped forward on the condyles of the femur with little force; also, there is lateral instability and tenderness to pressure over the patellar tendon. X-ray may show damage to the bones as mentioned.

The posterior crucial ligament is less commonly ruptured, but presents a similar picture, except that the tibia does not slip forward in extension, but instead, with the knee flexed to a right angle, there is excessive anterio-posterior movement of the tibia on the condyles of the femur, and tenderness in the popliteal space over the posterior ligaments of the joint.

With force still greater than in the preceding cases, all the ligaments may be ruptured, and a dislocation in any one of the four directions may occur. The commonest of these, however, is an anterior dislocation of the tibia, and this is especially important, because the popliteal artery may be compressed by the condyles of the femur, and if not quickly treated by reduction of

the dislocation, gangrene of the foot may result.

The pathology is obvious, and the findings are those of deformity, movement in any direction with soft crepitus, and marked swelling. Nerve and blood-vessel injury as mentioned may be present.

Those interesting structures in the knee-joint, the semilunar cartilages, are frequently injured, and again the football field, other sport and industry provide the necessary injuries in many cases. The usual history is that with the knee slightly flexed, some violent effort is attempted, often with an element of rotation at the knee, with the result that the semilunar cartilage is torn from its attachment at either end, split longitudinally, or broken in one of several directions. The method of producing these injuries is, probably, when the cartilage is firmly compressed between the tibia and condyle of femur, the force of the leg suddenly tightens the internal lateral ligament. The cartilage is attached to the latter, and consequently is torn across somewhere between the part held firmly between the bones and the site of attachment of the ligament. The loose end of the cartilage is then free to wander about the joint and be nipped by the condyles during movements. The external cartilage is injured less frequently.

The first as well as subsequent attacks are characteristic. The patient is seized with a violent pain over the whole knee, but worse on the inner side. Immediately there is inability to perform further movements, and the joint remains locked in this position of slight flexion, with intense pain and spasm of muscle, for varying times from a few seconds or minutes to hours or days. Effusion into the joint rapidly occurs.

Usually the pain disappears quite suddenly, movement returns immediately, and apart from the effusion, which clears up in a few days, there is no disability and no discomfort following. Unfortunately, the loose end of cartilage is ever present to get in the way of the gliding tibia, and at most inopportune times and without warning, a similar attack may recur. The seriousness of such an attack may be appreciated if the victim be a structural-steel worker, or employed in hazardous jobs where sure footing is essential. After repeated attacks of this sort, accompanied by synovial effusion, the ligaments and capsule of the joint become stretched so that the knee becomes less stable, and finally a condition of chronic synovitis may persist, accompanied by an effusion of varying degrees, with constant discomfort.

The treatment of ruptured ligaments and torn cartilages seen after the first injury is rest. If the joint surfaces are placed in apposition, the ligaments or cartilages may be restored to their normal relationships, and if retained in those positions by splints, such as circular plaster from ankle to groin, may heal and resume normal function later. Fixation for a month to six weeks, depending on the injury, is sufficient. If, however, there is improper replacement of the parts, or if function which puts strain on the injured ligament or cartilage is allowed too early, there may be incomplete healing by fibrous tissue which may stretch and result in permanent disability. Many cartilage injuries either do not heal or are not given an opportunity to do so, with the result that has already been described as recurring dislocation.

When ruptured ligaments have not healed well enough to provide sufficient support for the joint, many forms of treatment have been devised. Bandages, hinges applied externally, etc., have not given satisfaction, and the best treatment at the present time is an operation to reconstruct the ligaments from transplanted tendon or fascia. A ruptured cartilage that has not healed in place is best treated by excision of the whole structure.

Loose bodies may be the nature of a foreign body, such as a bullet, etc., introduced from without, but the term ordinarily implies that the object is derived from the joint. Many of these loose bodies are pieces of bone or cartilage chipped off the surface by an injury, the former coming from any part of the joint, but more commonly from fractures of the spine or tubercles of the tibia, or from the condyles or intercondyloid notch of the femur. Fragments of articular or semilunar cartilage may be broken off as well as hypertrophic tissues from the margins of joint surfaces in arthritis. Acute or chronic arthritis or synovitis may separate cartilage or bone as sequestra, or may produce fibrin or pus, which may later be the nucleus for a loose body. The haemorrhage or effusion following injury may provide agglutinations of fibrin to act in a similar way.

These bodies tend to form oval, somewhat flattened masses when the result of inflammation, and are laminated, showing that they increase in size. Those resulting from injury may be any shape, but if not recent ,they are covered by layers of fibrin, etc. The effect of these bodies in the joint is much the same as that of a ruptured semilunar cartilage. They cause locking for a short time only, which is described by some patients as a thump in the knee, accompanied by painful spasm of muscles and later, more or less effusion and dysfunction. Sometimes they are palpable in the synovial reflections, especially above or beside the patella, and slip away to bury themselves in the deeper parts of the joint on the slightest touch. Those containing bone, and many of the others which are calcified, show on X-ray plates, but must not be confused with sesamoid bones commonly found in the outer and inner heads of the gastrocnemius muscle. When there are no general contraindications, such bodies should be removed by operation to prevent injurious effects on the joint.

There is an interesting condition which follows injury in some cases, and because of the peculiar pathology which it presents, is called osteochondritis dissicans. The articular cartilage, including a varying thickness of bone beneath, is loosened over a limited area, but remains fairly well in position. The cartilage is whitish or yellowish, and microscopic section of the bone shows it to be dead. The remainder of the joint may be quite normal. Aching or pain in the joint, with possible limitation of full extension or flexion, or pain on weight bearing, are the chief symptoms. There may be tenderness over a localized area of a condyle, or nothing to indicate a local lesion. X-ray shows an area which looks like a very localized fracture of part of the joint surface without displacement, or a small defect in one of these surfaces, with evidence of a loose body elsewhere. It is best treated by removal of all the separated tissue, and if not so treated the diseased area appears to increase in size.

Apart from producing loose bodies in the joint, the spine of the tibia may fracture well down into the substance of the condyles, and if not retained in perfect position it may obstruct extension of the joint. It may be associated with other severe injuries such as rupture of ligaments, and its treatment is either to obtain good position or to excise the fragment.

Fractures of the tuberosities of the tibia involve the joint, as do T-shaped fractures of the lower end of the femur, but these are more problems of the general subject of fractures. However, it should be mentioned that the results of these injuries depend chiefly on the ability to obtain anatomical relations to the joint surfaces. A small defect in alignment of fragments involving joint surfaces may cause pain on weight-bearing, and almost certainly will cause arthritis in future.

Fracture of the patella may be complete when the fragments are separated, or incomplete when the fibres of

the rectus femoris remain intact on its anterior surface. It results from direct injury when the lesion is of the stellate variety, or from muscular action, as in falling some distance and landing on the feet with the knees flexed, when the lesion is transverse. Immediately, there is pain, swelling and inability to extend the knee. The fragments are fairly widely separated in the complete variety by the pull of the extensor quadriceps, making them easily palpable with the space between; and the joint is distended with blood. It is very difficult to approximate the fragments and so obtain bony union without open operation. A fibrous union will stretch so that full extension of the knee by voluntary effort is impossible, and this movement necessary in walking is lacking. Consequently, this is one of the fractures where operation is required. The joint is opened by an anterior horse-shoe incision, the blood clots are removed, and the fragments of patella are carefully fitted to leave a perfect surface posteriorly. They are retained in that position by various kinds of sutures, of wire or fascia. Rupture of the patellar tendon is rare, but gives similar symptoms and requires the same sort of treatment, except that the lesion may be extra-articular, and the tendon, instead of bone, has to be dealt with.

The commonest injury about the knee that appears in every household, sooner or later, is one affecting the prepatellar bursa. It becomes painful and distended, but the swelling does not follow the outline of the knee-joint which can be moved fairly freely without pain. It is limited to a much smaller area in front of the patellar tendon and lower half of the patella. The symptoms rapidly improve with rest and protection, only to recur later if the injury is repeated, finally resulting in a chronic bursitis or housemaid's knee.

In conclusion, it might be repeated that injuries to the knee joint are quite common, and that symptoms develop immediately following, when a gross lesion has been produced. If improvement is not apparent, not going on to a complete cure with relief of symptoms following palliative treatment, it may be assumed that there has been more than a sprain. It is necessary to keep in mind the fact that chronic and low-grade infections may first be noticed following slight injuries, and further investigation is necessary if there is not a rapid response to treatment.

Surgical Aspects of Gastric and Duodenal Ulcers.

By H. W. WOOKEY, M.B., F.R.S.C. (Eng.).

In general surgical practice, gastric and duodenal ulcers are by no means uncommon. In this country, it has been found that about 70% of these ulcers occur in the duodenum. In Europe and in England, however, this predominance of duodenal ulcer is not so marked. It is a curious thing that a large percentage of our patients suffering from gastric ulcer were born in England or Europe, or have recently come to this country.

In seven years, from 1922 to 1928 inclusive, 875 cases of ulcer were treated in the General Hospital. Of these, 663 were duodenal and 212 gastric ulcers. Men were affected in about 75% of the cases.

It is essential to recognize a distinction between acute and chronic ulcers. Acute ulcers are often multiple, and present small, clear-cut erosions of the mucosa. These lesions do not, as a rule, involve the muscle layer of the organ, and consequently perforations are rare. They may, however, cause severe haem-

orrhage, and in rare instances even fatal haemorrhage.

Superficial scars of healed gastric and duodenal ulcers, and not involving the muscle coat, have been found at autopsy. At the London Hospital, in a series of 3,760 autopsies, scars were found in 208.

Chronic ulcers, on the other hand, are usually single, and destroy the muscle coat of the organ. They tend to persist, and may perforate or cause severe haemorrhage. In the course of time extensive scarring may produce stenosis, in the mid gastric region, at the pylorus, or in the first part of the duodenum.

Scars of the stomach and duodenum with destruction of the muscle coat are rarely found at autopsy. This would suggest that chronic ulcers tend to persist rather than to heal.

GASTRIC ULCER.

Gastric ulcer may be classified as follows:

(1) Those which are the result of a specific infection, as in typhoid, tuberculosis, and syphilis.
(2) Ulcers complicating some other disease, as in cirrhosis of the liver, Banti's Disease, or chronic renal insufficiency.
(3) Malignant Ulcers.
(4) The so-called pepic ulcer.

The discussion in this paper is confined to the peptic ulcers, and of these two types are recognized, the acute and the chronic.

(A) *Acute gastric ulcers* occur:

(1) As a complication of an acute infective condition elsewhere, as in acute appendicitis, acute cholecystitis, septic wounds, compound fractures, etc.
(2) The so-called medically acute gastric ulcer.

These two types of acute gastric ulcers are of clinical interest. The role of infection in group No. 1 is very striking, whereas the aetiology of the other group is somewhat obscure.

Acute ulcers may occur anywhere in the body of the stomach, though they are more commonly found on the posterior wall close to the lesser curvature in the pyloric portion of the stomach. They rarely require surgical intervention.

(B) *Chronic Gastric Ulcers.*

Chronic gastric ulcers are much more commonly single than multiple. The usual site is on the posterior wall of the pyloric portion of the stomach, just below the lesser curvature and near the incisura angularis.

The second common position is near the pylorus on the posterior wall of the stomach. The third position in order of frequency is high up on the posterior wall near the lesser curve, and close to the cardiac orifice. Occasionally an ulcer is situated at the pylorus and involves the sphincter.

Chronic ulcers are clear-cut, with slightly rolled-over, undermined margins. They entirely destroy the muscle layers of the stomach down to the peritoneum, and may involve the pancreas or liver.

There seems to be some clinical evidence that chronic ulcers may heal as a result of conservative treatment. It must be said, however, that scars replacing all layers of the stomach are rarely found at autopsy.

Complications of Chronic Gastric Ulcer:

1. *Penetration.*—Chronic gastric ulcers tend to involve deeper tissues and to spread somewhat laterally. In some posterior wall ulcers they are of considerable extent, involving large areas of pancreas. All museums contain such specimens, though they are relatively rare at operation.
2. *Perforation.*—It has been said that about 10% of all gastric ulcers perforate. The accuracy of this figure is difficult to prove. Gastric ulcers perforate on the lesser curve or the anterior wall of the stomach. These ulcers have extended over the lesser curvature and involve the anterior

wall. Posterior perforations into the lesser sac of peritoneum are uncommon because of pancreatic adhesions.

3. *Haemorrhage.*—In the history of a chronic gastric ulcer, haemorrhage may occur from time to time. As the ulcer becomes deeper, a large vessel may be eroded and a fatal haemorrhage occasionally result. Several specimens in our museum show an erosion of the splenic artery.
4. *Stenosis.*—A chronic gastric ulcer persisting over a long period of time may produce an hour-glass constriction of the stomach when situated on the posterior wall near the incisura. They are singularly confined to women. Pyloric stenosis may complicate the ulcer situated near the pylorus.
5. *Relationship of Cancer to Ulcer.*—The problem of cancer as a complication of gastric ulcer has given rise to a great deal of controversy. Some observers have claimed a striking relationship between the two. Others deny any possible connection between cancer and ulcer. Possibly this question can never be definitely settled.

In an analysis of a large series of cases of cancer of the stomach in the General Hospital, it was found that 10% gave a long history extending over a period of years, five, ten, or even fifteen. These patients suffered from periodic attacks of discomfort or pain before carcinoma was ultimately proven. This may be taken as an indirect evidence of the previous presence of an ulcer. On the other hand, it has been suggested that the entire history is not inconsistent with the course of cancer. If this is so, we will have to revise the generally accepted idea that cancer of the stomach will always be fatal within three years.

In the aetiology of malignant disease, the most important factor is that of chronic irritation. It may even be said that carcinoma is the outcome of an evolution through various phases of inflammation resulting from irritation. Chronic ulceration of the stomach is the only common example of inflammatory change ever found in the organ, and may be a factor in the origin of cancer.

Symptomatology of Gastric Ulcer:

It must be recognized that in a certain number of cases of gastric and duodenal ulcer there are no symptoms whatever until complicated by haemorrhage or perforation.

The symptoms of gastric ulcer are extremely variable. There may be only a sensation of discomfort, or mild pain coming on immediately after food or later. In other cases the pain is severe, with a variable relation to the taking of food.

It has been generally stated that if an ulcer is situated close to the cardiac orifice, discomfort or pain immediately follows the taking of food, whereas when the ulcer is near the Pylorus these symptoms are delayed for an hour or more. It would appear that such a generalization is not always true. The researches of Dr. Malcolm Wilson would cast some doubt upon this hypothesis. The time relationship between the taking of food and the onset of pain varies in different individuals. It also varies in many patients after different meals. This latter variation is probably due to the size of the meal and is influenced by the state of tone of the gastric muscle.

The most striking thing about the symptomathology of gastric ulcer is its periodicity. Attacks of pain or discomfort lasting from a few days to two weeks are followed at intervals by freedom, which may last several weeks or months. The explanation of this freedom from symptoms is obscure, as the ulcer is still there and unchanged.

Vomiting occurs in about 60% of cases of gastric ulcer, and gives immediate relief. Haematemesis, if severe,

occurs late in the disease, and may be fatal. The appetite is good, and there is usually no loss of weight. As a rule, the bowels move regularly.

Chronic gastric ulcer occurs more commonly in men between thirty and forty years of age. Physical examination will reveal only deep tenderness on palpitation. A test meal, as a rule, shows the presence of a relatively high amount of free hydrochloric acid.

The symptomatology of gastric ulcer is modified by the complications:

1. In the *penetrating* ulcer, the attacks of pain or discomfort last longer and become more frequent. When pancreas or liver is involved, periodicity is lost, and pain becomes more or less continuous. The pain, instead of being localized, radiates to the back, and may be referred to the left shoulder. Vomiting no longer gives complete relief and appetite is diminished.
2. *Perforation.*—There are three clinical types of perforation:
   (a) In the first group representing about 10% there is severe abdominal pain, with shock and vomiting, with no warning or preceding history of illness.
   (b) In the second group of cases there is a warning of impending perforation. During one of the periods of symptoms, pain becomes more severe, and, after persisting for a variable time, is followed by perforation.
   (c) In the third group, and by far the commonest, perforation occurs with no warning whatever. These patients have usually suffered for years from digestive disturbances, and perforation follows a meal or after exertion.

   The clinical signs of perforation are remarkably constant. In a series of 102 cases of perforated ulcer treated in the General Hospital, they were as follows:
   1. Absence of abdominal movements on respiration.
   2. A board-like rigidity of the abdominal wall.
   3. Generalized superficial tenderness of the abdomen.
   4. In some cases a loss of liver dulness and the presence of fluid in the peritoneal cavity.
3. *Haemorrhage.* — Though haemorrhage may occur from time to time in gastric ulcer, severe haemorrhage is met with late in the disease, and when a large vessel is eroded may be fatal. Haemorrhage from a gastric ulcer, when small in amount, may pass unnoticed in the stool, but when severe usually produces vomiting.
4. *Stenosis.*—An hour-glass type of stenosis may complicate an ulcer on the posterior wall close to the lesser curve. The ulcer has become fixed to the pancreas, the greater curvature of the stomach is drawn up to the ulcer and fixed by organized fibrous tissue. Hour-glass stenosis appears to occur only in women, and is usually associated with a low-lying stomach.

   Pyloric stenosis is frequently the result of an old ulcer near the pylorus. In both types of stenosis periodicity of symptoms is lost. Pain is much more constant and immediately follows food. The pain is of a colicky type. Vomiting becomes a marked symptom, and large quantities of material may be brought up. Haematemesis is unusual because of the excessive fibrosis. Appetite diminishes, and there is a marked loss of weight. The bowels are usually constipated. On physical examination—if stomach has retained its tone—visible peristalsis may be seen. When the tone is lost, stomach splashing may be elicited.
5. *Relationship of Cancer to Ulcer.*—A patient who has suffered from periodic attacks of indigestion over

several years notices that his symptoms have changed.

Pain and discomfort may be less severe, but are much more constant. His appetite has failed, and vomiting, which used to give relief, no longer does so. He is losing strength and weight.

CHRONIC DUODENAL ULCER.

The most common site is on the posterior wall of the first part of the duodenum above the bile duct. An ulcer on the anterior wall is usually associated with the one on the posterior wall. Duodenal ulcer is about four times as common in men as in women, and the average age is about forty.

There are unquestionably some cases of duodenal ulcer which cause no symptoms at all. The usual history, however, is of attacks of severe pain in the epigastrium, coming on two or three hours after food. The pain may go through to the back, and is often relieved by pressure. It is nearly always relieved by taking food, and, in the early stages, by sodium bicarbonate. The usual story is that a patient has about two attacks a year, lasting from a few days to a week or ten days.

Vomiting never occurs in duodenal ulcer unless there is obstruction or an associated gastric lesion. Haemorrhage, when it occurs, is always dangerous, because of the large vessels in relation to the base of the ulcer. The appetite, if anything, is increased.

Physical examination will reveal only a point of deep tenderness in the epigastrium. Free hydrochloric acid in the test meal is increased. The X-ray shows a marked hypermotility of the stomach with a deformity of the caput of the duodenum.

The Complications of Duodenal Ulcer:

Penetration.—A duodenal ulcer may progress rapidly and involve the pancreas, but in the majority of cases this process is slow. The symptoms are modified by this complication in much the same way as in a penetrating gastric ulcer. Pain becomes more severe, attacks last longer, and the interval of freedom is shorter. The pain goes through to the back and may be referred to the left shoulder.

Perforation.—In a series of 102 perforated gastric and duodenal ulcers treated in the General Hospital from 1922 to 1928, there were 87 duodenal and 15 gastric perforations.

In the duodenum, the perforation is almost invariably found on the anterior surface close to the superior border and just beyond the pylorus.

In 10% of these cases there was no previous history of digestive disturbance. At operation clean cut holes were found, with very little surrounding induration. In the remainder the perforations were surrounded by wide areas of induration, and histories of long-standing attacks of indigestion were obtained.

Occasionally the gall bladder or liver became adherent and masks the perforation for a few days.

Haemorrhage.—In many cases of duodenal ulcer, haemorrhage occurs from time to time, and may either be recognized by chemical test, or, if severe, by the so-called tarry stools. Very often an attack of faintness and dizziness is the first evidence of haemorrhage. Haematemesis is rare.

Stenosis.—Duodenal stenosis may be the result of a long standing ulcer. Such patients present the typical symptoms of pyloric stenosis. Attacks of pain become more numerous and severe, and vomiting now becomes a feature.

Occasionally the common bile duct is involved in the base of the ulcer. There is an excellent example of common duct stenosis in the Pathological Museum, in which the common duct is completely ob-

structed by the scar of a duodenal ulcer.

Carcinoma of the duodenum is practically unknown, and has no bearing on the problem of duodenal ulcer.

TREATMENT OF GASTRIC AND DUODENAL ULCER.

All cases of ulcer should be treated conservatively where possible for at least six months. Unquestionably many cases respond to medical treatment and are cured.

The indications for surgical interference are:

1. Failure to respond to medical treatment
2. When medical treatment cannot be carried out.
3. Progressive changes in the ulcer.
4. Perforation.
5. Stenosis.
6. Repeated haemorrhages.
7. The suggestion of Carcinoma of the stomach.

Treatment of Gastric Ulcer.

It is generally conceded that the ideal operation for gastric ulcer is a partial gastrectomy. The duodenum is divided just beyond the pylorus and the cut end closed. The pyloric portion of the stomach, together with the ulcer, is excised, and a Polya type of anastamosis done.

In cases in which there is extensive involvement of, or adhesion to, the pancreas, the base of the ulcer is left undisturbed. A drainage tube is introduced down to this area.

The more conservative operation of simple gastro-enterostomy has not proved to be satisfactory, as it does not prevent recurrent haemorrhage or perforation. It is also occasionally followed by a stoma ulcer.

In certain cases a preliminary gastro-enterostomy followed by resection later is wise. The indications for an operation in two stages are as follows:

1. In elderly patients.
2. In all patients in poor physical condition.
3. In cases of stenosis.

Treatment of Duodenal Ulcer.

The operations for duodenal ulcers are many and varied, and there is a good deal of difference of opinion about their relative values.

A simple gastro-enterostomy is often effective, and is the least dangerous. This operation may be modified by an attempt to destroy the ulcer either by excision or by cauterization. In some cases, however, a stoma ulcer may follow a gastro-enterostomy, and this may perforate or bring back symptoms.

Many surgeons, especially on the Continent, advise partial gastrectomy, with or without the removal of the ulcer area as the most satisfactory operation.

A chronic ulcer densely adherent posteriorly may be very difficult of excision. Excision of these adherent ulcers is associated with a higher mortality.

Treatment of Perforated Ulcers.

Such cases should be operated on immediately. Complete relaxation of the already rigid abdominal wall is necessary,, and spinal anaesthesia is particularly valuable.

On opening the abdomen, as much free fluid as possible is sucked out or sponged out with the least possible disturbance of the bowel.

The perforation should be closed by some form of purse string or Lembert suture. It is of the utmost importance that the closure be effective, as sutures sometimes tear out. Where the perforation is surrounded by indurated tissue, it is necessary to roll in all this area and to re-inforce the line of suture by an omental graft.

A drainage tube may be introduced at the upper end of the incision. Drainage, however, does not seem to be of great importance, as it is generally recognized that one cannot drain the peritoneal cavity. Still, in one or two cases at the General Hospital in which the suture line gave way, a drainage tube probably saved the patient's life.

In the series of 102 perforations there were 25 cases in which a gastro-enterostomy was done at the same time.

All these cases recovered, and, by comparison, have done better than the others. The surgeon must use his judgment at the time of operation, and a gastro-enterostomy should not be done where operation has been delayed, or the patient is in a serious condition.

The Management of Haemorrhage.

Haemorrhage very seldom requires an immediate operation. A patient who has lost a great deal of blood is not a good operative risk, and an attempt should be made to improve the general condition before attempting any operation.

Absolute rest in bed on a restricted fluid diet, with the judicious use of morphia, will control most cases of haemorrhage. The stool is examined each day and a red blood count and haemoglobin estimation done daily. Blood transfusion should be given when the Haemoglobin falls below 50%. If possible the patient's Haemoglobin should be restored to about 70 before operation.

After repeated haemorrhage, or in cases in which haemorrhage is alarming, the patient may be transfused and operated on at the same time. This is an emergency measure, and is fortunately not often necessary.

A simple gastro-enterostomy may be effective in preventing a recurrence of haemorrhage in duodenal ulcer. In cases of gastric ulcer in which haemorrhage has occurred, the problem is more difficult, and some effort must be made to control the haemorrhage by dealing with the bleeding point directly.

The stomach may be opened on the anterior wall and the ulcer directly exposed. The ulcer may be destroyed by cautery, locally excised or over-sewn with catgut, after which a gastro-enterostomy is done. In favourable cases a partial gastrectomy may be undertaken.

Similar methods may be used in cases of duodenal ulcer with haemorrhage, but the operative risk is greater.

An effective method is to ligature the gastro-duodenal, the superior pancreatico-ducdenal and the right gastro-epiploic arteries. The scar of the ulcer is then imbedded by purse string suture and a gastro-enterostomy done.

ARTHRITIS

By A. E. PERRY, B.A., 3T0

(Continued From Last Issue).

Treatment.—The patient should be advised to pay strict attention to his living habits, abstaining from alcoholic beverages and heavy foods. His life should be led in the out-of-doors as much as possible, having plenty of exercise. He should always be dressed warmly and suitably for the prevailing weather. The diet should be carefully studied. Reduction in carbohydrates in some patients is of great importance as well as reduction in nitrogenous foods. The foods rich in purins should be omitted as far as possible, such as bouillon, beef extract, sweetbreads, liver, kidney and brain. Milk and eggs and some fresh fruits and vegetables, except strawberries and bananas, are purin free and of great value.

In the acute attacks, the patient should be in bed on a milk diet and taking water freely. The affected joints should be wrapped in cotton wool and elevated. A mercurial purge and tincture of colchicum (20-30 minims) every four hours with potassium citrate, gives considerable relief by lessening pain and and rapidly reduces swelling and reddening. The course of the drug should be watched and stopped as soon as pain is relieved. Morphia may be necessary to control the pain.

In the chronic conditions cincophen (10-15 grains) three times a day is more useful, or it may be given 7.5 grains twice a week as a preventive. These chronic and irregular forms are best treated by dietetics and hygienic measures.

(b) Scurvy (Scorbutus).

Etiology.—Scurvy is considered as a deficiency disease due to lack of vitamin C in the food supply over an extended period of time up to four or six months.

Pathology.—Occasionally in the course of this disease there is hemorrhage into the joint cavity. The synovial membrane is swollen and inflamed. The cartilage or bone is rarely eroded or seriously damaged.

Signs and Symptoms.—The presence of scurvy along with swelling of the joints and hemorrhages from other surfaces such as the mucous membranes and subperiosteally should be suggestive of this condition.

Treatment.—Administration in the diet of vitamin C will rapidly clear up the condition. A diet of meat and fresh vegetables and the juice of two or three lemons or several oranges a day is sufficient. If it is far advanced, then a full diet has to be approached slowly.

(c) Arthritis in Hemophilia.

Etiology.—The cause of hemophilia is unknown. It is a hereditary condition appearing in males and transmitted through females.

Pathology.—In hemophilia, hemorrhages tend to occur from mucous membranes, skin and synovial surfaces on the least trauma. This may occur into the joint cavities and the knee is most commonly affected. Blood in the capsule produces an irritation with resultant thickening of the capsule. If this occurs repeatedly, the capsule and joint presents a picture not unlike that of osteo-arthritis. The cartilage is fibrillated and eroded, with exposure of the underlying bone and the articular edge is surrounded by osteophytes. The synovial membrane presents villi as well as being thickened.

Signs and symptoms. There is usually a sudden swelling, with some pain and inflammation following a slight injury, usually occurring in children. Frequently it has to be differentiated from tuberculosis. A history of previous bleeding should aid considerably in the diagnosis.

Treatment.—The joint should be immobilized to prevent deformity, and under no circumstances should it be opened or incised. The coagulation time may be lessened, if hemorrhage is still persisting, by injection of a non-specific protein or by a transfusion of blood.

VI. ARTHRITIS OF TOXIC ORIGIN.

(a) Intermittent Hydrarthrosis.

An effusion of three to five days duration, occurring into a joint, in a definite cycle which averages about twelve days but may be as often as five days apart or as long as thirty.

Etiology.—The etiology is unknown.

Pathology.—The fluid in the joint is suddenly increased in quantity. In the course of a few days, the joint returns to normal. Some 77 cases are reported in the literature up to 1921 and very little is known of its pathology.

Treatment.—In the acute stage, local rest is important, otherwise treatment is of little value.

(b) Anaphylactic Arthritis.

Etiology.—The patient needs to have an allergy to some exciting cause. It is frequently associated with serum sickness.

Pathology.—The joint may suddenly become swollen. This lasts a few hours and subsides. There is some pain and several joints may be affected simultaneously or in succession. An increase in the synovial fluid is the chief pathology.

Signs and symptoms.—Sudden painful swelling along with other evidences of anaphylactic reaction. Suddenness of onset, shortness of duration and variability are all suggestive of the condition.

Treatment.—Adrenalin chloride in small doses (minims 8) subcutaneously is of great value.

VII. RHEUMATIC FEVER.

Arthritis frequently occurs along with rheumatic fever, or is considered a manifestation of the disease.

Etiology.—The cause of the arthritis still comes in for a great amount of discussion. A view that is gaining ground is that rheumatic fever is a manifestation of allergy to streptoccus viridans. To quote Derick, Hitchcock and Swift, "we present a conception that the pathogenesis of rheumatic fever can be explained by the existence in certain individuals of a condition of hypersensitiveness (allergy) to streptococci resulting from repeated low grade infections or from the persistence of foci of infection in the body. When under suitable circumstances streptococci or products of streptococci are disseminated to the tissues, these tissues over react and the characteristic picture of the disease results. . . . Given then an individual in this condition with some tissues more sensitive than others, or with anatomical peculiarities, in heart, joints, subcutaneous tissues or brain, it may only be necessary to have an acute tonsillitis, pharyngitis or bronchitis. Such an infection practically always antedates an attack of rheumatic fever by a few days or weeks, and we may then have the proper setting for some or all of the manifestations of the disease, such as carditis, arthritis, subcutaneous fibroid nodules or chorea, depending upon which tissues are involved." Many other workers have been searching for some organism in the blood or tissues to which the responsibility for the pathological picture might be placed. There has been long established a definite relationship between foci of infection, particularly infected tonsils, and rheumatic fever.

Pathology.—The joints may be swollen, reddened and hyperaemic and the reaction is practically limited to the synovial membrane and ligaments with a marked effusion fluid. The fluid is turbid, contains albumin, leucocytes and some fibrin flakes. In severe cases, there may be some permanent thickening of the membrane, but usually it subsides in the course of three to five days with no lasting damage.

Signs and symptoms.—An acutely inflamed joint, painful and hot with a fever is usually found. It may be monarticular or polyarticular occurring in succession or simultaneously. The duration is about three to five days associated with drenching sweats and extreme prostration.

Treatment.—General rheumatic fever treatment is necessary. Locally, the affected joints should be wrapped in cotton. Hot cloths saturated with Fuller's solution (soda carbonate drams vi, laudanum oz. i, glycerine oz. ii, water oz. iv.) or lead and opium lotion may be applied to relieve the pain. Oil of wintergreen and spirits of chloroform are valuable locally. Great comfort may be experienced by putting a splint about the joint to prevent movement by fixation.

The pain is relieved remarkably by the use of salicylates, which is commonly administered in the form of acetyl salicylic acid in doses up to 90-120 grs. per day with twice the quantity of soda bicarbonate.

VIII. ARTHRITIS OF NERVOUS ORIGION.

Charcot's Disease of the Joints.

Etiology.—This peculiar neuropathy occurs either as a manifestation of tabes dorsalis or along with it. The condition was first described by Charot in 1868. The precipitating cause is unknown and may develop very suddenly, almost over night. Interference with a trophic nerve has often been suggested as a cause but, if such is the case, it is difficult to explain the usual affection of one joint only and its exceedingly rapid onset. On the other hand, if it is a syphilitic process it is the only syphilitic lesion of its type in the body. The joint fluid may give a positive Wasserman when the blood does not. The

knee is usually the joint most commonly affected, but it may attack any joint.

A similar condition prevails in syringomyelia with the exception that it is usually found in the upper extremities.

Pathology.—The acuteness of the onset and process of the disease, rapidly change the appearance of the joint, so that early it resembles markedly osteoarthritis, as the cartilage is eroded, the bone exposed, the synovial membrane thickened and a fringe of exostoses may occur.

However the proliferative change only occurs in the early stages, as later in the course, the phenomena of dissolution and destruction of the bone reign supreme. This may go to the point where it appears that something has dissolved the joint away, leaving no trace of any new bone formation. The joint is freely moveable in all directions due to its flail like condition and softened ligaments. Subluxations frequently result due to the degenerated condition of the joint and its ligaments.

Signs and Symptoms.—Tabes dorsalis is usually present before onset. The onset is characterized by an acute, sudden, swelling which is painless, followed by a painless hypermobility which suggests destruction of the joint. Grating is frequently found on movement and also atrophy about the joint. Subluxations are frequently present.

Treatment.---Most forms of treatment are discouraging. Extension of the joint may retard destruction. Splinting in a Thomas splint or better in a Thomas caliper splint so that the patient can be kept walking as it undesirable to take a tabetic patient off his feet, is a suitable method of treatment. Aspiration may save the joint from too great distension and consequent loss of stability.

Ovarian Hormones.

S. J. BOCHNER, B.A., 3T2.

The ovary is primarily concerned with the production of ova. Further important functions appear in the regulation and control of the genital tract for the protection and development of the ovum; and again in the differentiation and development of the physical characteristics of the female favouring the process of conception.

Ovariectomy in the human is, as a rule, performed late, with the result that the external changes are not very well marked. However, there is evidenced in all cases an atrophy of the genital tract, cessation of menses, an accumulation of fat, increase of hair on the face, the concave upper margin of the pelvic hair of the female tends to become convex, and occasionally there are physical disturbances as changes in metabolism.

"Sex Specific Action."

Tandler[1] observed that the castrated man presents many characters similar to those of the ovariectomized female. He described these as tending towards the infantile type, a form from which sexual divergence had not taken place. Lipschutz[2] developed the thesis that the hormones of the sex glands have a "sex specific action which is superimposed upon an asexual soma" during embryonic life. Steinach[3] carried out a series of experiments on birds and mammals by means of cross-transplantation, throwing definite light upon the question.

He implanted ovaries into castrated male rats at the age of 3-4 weeks. In one series they were implanted on the peritoneal surface of the abdominal wall, and in another on the external surface. Similar work was done im-

planting tests upon ovariectomized female rats.

Results of the Feminized Castrated Male Rats.

(1) The feminized rat exhibited the tail reflex when followed by a normal male.

(2) The rat was treated by normal male rats as though a female.

(3) There was marked hypertrophy of the mammary glands to the extent of lactation and the acceptance of suckling young.

(4) There was a marked decrease in growth rate. The feminization of the male rat appears to carry it further, into a state of hyperfeminization.

Results of Masculinized Ovariectomized Female Rats.

(1) The masculinized female follows the normal female as if it were a normal male, and is accepted as such.

(2) The teats remain undeveloped.

(3) The uterus undergoes atrophy.

(4) The genital region undergoes masculinization.

(5) Growth is stimulated, such that the rat becomes larger than the normal male.

If the graft undergoes degeneration the rat returns to the castrate form.

These experiments explain the results of castration in the production of the man-like woman and the woman-like man; as Tandler expresses it: "The prepubertal period prolonged."

The Sexual Cycle.

The ovary consists of a solid mass of fibrous stroma covered by a layer of cubical cells, the germinal epithelium. Imbedded in the organ are many "vesicular ovarian follicles" and certain epitheloid cells, termed interstitial cells.

While the formation of the follicle begins before birth, development does not proceed until puberty, degenerating again in seniscence. The larger follicles consist of an outer fibrovascular coat and an inner layer of large nucleated cells, the membrana granulosa, which projects into the central cavity forming the Discus Proligerus, in which the ovum is embedded. The cavity is filled by a transparent albuminous fluid, the Liquor Folliculi.

The mature follicle makes its way towards the surface, where on rupturing (ovulation) it frees the ovum and the liquor. There follows bleeding into the cavity forming the corpus hemmorrhagicum. This is in turn replaced by lutein cells forming the Corpus Luteum.

The sexually mature period opens with hypertrophy of the genital tract and mammary glands. This is followed by intermittent periods of hypertrophy and retrogression, which cyclic changes continue throughout the sexual life of all animals.

In lower animals, such as the rodent, these cyclic changes are very sharply defined, thus readily lending themselves to experimental study. The oestrus cycle is divided into

(1) Proestrus—development of follicles.

(2) Oestrus proper—ovulation.

(3) Postoestrus—accompanied by growth and secretion of the genital tract associated with the development of the corpus luteum. This phase, if impregnation occurs, goes on to pregnancy, the corpus luteum remaining patent. If there is no impregnation, the corpus luteum degenerates and the growth is discarded. This stage merges into the next proestrus.

The control of this cycle is primarily hormonal. This was demonstrated beyond question by the following experiments:

(1) Transplantation of the ovary in an ovariectomized guinea pig has no detrimental effect upon the onset of puberty, or the progress of the oestrus cycle. Degeneration of this graft causes cessation of sexual activity.

(2) Frank and Goldberger[4] described positive reactions in ovariectomized guinea pigs by injecting the blood of pigs in oestrus or the blood of pregnant women.

(3) Further verification was procured by the preparation of an extract of the ovary which on injection kept an ovariectomized animal in normal condition. The internal secretion responsible for these changes is carried by the blood stream. There appears to be a limiting threshold for this substance in the blood, as the urine of animals in oestrus is found to be active.

Criteria of Experimental Assay.

The activity of an extract in experimental assay is indicated by various criteria, based upon the oestrus cycle.

(1) In the prepubertal rat, the vagina is represented by a solid cord of cells. The onset of puberty is indicated by the proliferation and canalization of tthis cord with the formation of the vagina. An extract is active when it will produce premature puberty.

(2) Swelling and hyperaemia of the external genitals, and hypertrophy of the mammary glands in an ovariectomized animal indicates activity in production of oestrus.

(3) Activity of the uterus may be demonstrated by histological examination.

(4) Stockard and Papanicolaon[5] devised a very excellent method of following the cycle of events with a fair degree of accuracy, both qualitatively and quantitatively.

(a) In the non-oestrus rat, smears of the vagina stained with hematoxylin and oesin showed the presence of nucleated cells in various stages of nuclear degeneration and cytoplasmic shrinkage, together with some polymorphonuclear cells.

(b) The onset of oestrus is accompanied by congestion of the genitals. A smear of the vagina shows nucleated epithelial cells. When the oestrus is at its height the vagina is almost perfectly dry. The smear shows cornified now nucleated red oesin staining cells.

(c) As oestrus recedes the changes are in the reverse order.

This last method supplied a stable criterion upon which extracts could be standardized, and by means of which the work could be carefully followed in all its stages, throughout several cycles. It therefore has stimulated the study as a whole. Allen and Doisy[6] used this method of controlling their work with considerable degree of quantitative accuracy.

The Corpus Luteum.

Fraenkel[7] claims that the corpus luteum is essential for the implantation. This body appears to be definitely associated with the growth of the genital tract. Lock,[8] working along the same idea, showed that the corpus luteum sensitizes the uterine mucosa to mechanical stimuli. He placed a glass bead in the uterine cavity of a guinea pig on the seventh day following unfertilized ovulation. There was produced within a few days a definite response, in the form of a mass of decidual tissue, which he termed a "placentoma." Destruction of the corpus lutuem by cautery made the production of these placentomata impossible. Further, it was shown that cautery of the luteum body during pregnancy resulted in abortion. There is evidently produced in this body a substance essential to the growth and nutrition of the uterus.

In later work, Loeb[9] found that injections of corpus luteum extract prevented ovulation in guinea pigs, and, further, that it is possible to accelerate ovulation by extirpation of the corpora. In the normal cycle the corpus lutuem is degenerated by the time the following ovulation occurs. Thus it would appear that the corpus luteum is the seat of the production of a hormone, which is one of the principal factors in regulating the duration of the cycle.

The Interstitial Tissue.

The interstitial cells form the prominent tissue of the ovary in the pre-

pubertal life of an animal. Steinach and Holzknecht[10] stressed the importance of these cells as the source of the ovarian hormone, terming it the "Puberty Gland." Parkes[11] has, by critical doses of X-ray, caused atrophy of the follicular tissue of the ovary of a mouse leaving the interstitial tissue intact. Following such treatment, the genital tract did not atrophy, but, on the contrary, appeared to hypertrophy, simulating the action of the corpus luteum. Histological examination further suggests the association of these cell to the luteum body, the cells being very similar in their lipoidal inclusions. There is thus a "constant luteum body" in the ovary, probably serving to maintain the normal nutrition of the genital tract.

The Graafian Follicle.

Allen[6] claims that the importance of the corpus luteum has been largely overestimated. He stresses the Graafian Follicle as the seat of the major ovarian hormone. He procured the liquor of the follicle by direct aspiration. Injection of an extract, prepared from this material, into ovariectomized mice produced normal oestrus changes, growth of the genital tract secretion, and the normal mating reaction. Following the series of injections, a degenerative phase set in corresponding very well with the normal reaction time. Injection into hibernating animals produced similar results. Injection into normal immature rats when the vagina is closed produced a rapid proliferation and opening of the vagina. The infantile uterus becomes transformed in two or three days, the muscle layers being well differentiated, resulting in essentially a premature puberty. These effects were produced in normal and ovariectomized animals and are therefore due directly to the hormone.

Thus it appears that:—

(1) The isolated contents of the large follicle contains an active substance, sufficient to induce vaginal proliferation in the immature animal and to induce maximal oestrus phenomena in rats and mice.

(2) The essential features of the oestrus reaction are due to hormonal stimulation of the tissues of the genital tract to growth and secretion.

(3) An absence or decrease of this hormone allows the degenerative phase of the cycle to set in.

(4) The reaction time of the experimental cycle is equivalent to the normal cycle.

(5) The female sexual reaction of mating also depends upon this active material.

(6) A single hormone produced by the follicles is all that is essential for the mechanism of the non-pregnant cycle of the rodent.

Allen[12] procured similar results, using the monkey Macaccus Rhesus, whose sexual cycle closely resembles that of the human, including the characteristics of menstruation. Five animals were used in a series of 13 experiments. A control period of three months following ovariectomy preceded the experiments. Two or three injections were given daily over a period of 9-20 days. The results procured were fairly definite. These animals showed: hyperemia of the external genitalia, hypertrophy of the breasts, and considerable growth in the uterus. Smears of the vagina showed growth of the vaginal epithelium to the point of cornification. After cessation of the injections the hyperemia disappeared, and bleeding followed the last injection in 3-7 days. The duration of these experimental menses varied from 1-6 days, no bleeding occurring during the injections. Histological study showed considerable growth of the vaginal epithelium, hypertrophy of the cervix, endometrium and the mammary glands.

There is thus produced as a result of follicular hormone:—

(1) Initiation of the periodic growth process of the female genital tract.

(2) The menses appear to be due to a decrease in the amount or temporary absence of this hormone, after it has been acting for a period.

(3) A specific secretion of the corpus luteum is not a necessary casual factor in the essential mechanism of the cycle.

Conclusions.

Since oestrus reactions can be produced by extracts of the Graafian follicle, in the absence of a corpus luteum, that body can not be essential at this stage. However, although the follicular hormone induces proliferation of the genital tract, it is undoubtedly true that the corpus luteum is essential for the sensitization of the uterine mucosa and maintenance of nutrition of the hypertrophied state.

In concluding, we may say that there are produced in the ovary three hormones:

(1) The interstitial tissue — the puberty gland of Steinach, determining sex specificity, and associated with the corpus luteum in the control of the state of nutrition of the genital tract.

(2) The corpus luteum—responsible for the maintenance of growth and nutrition.

(3) The Graafian Follicle, producing the oestrus reactions.

REFERENCES.

1. Tandler and Gross—Arch. Entro Mech. 29.
2. Lipschutz A. The Internal Secretion of the Sex Glands, 1924.
3. Steinach—Pflugers Archiv. 144.
4. Frank and Goldberger—Journ. Am. Med. Assoc. 1926.
5. Stockard and Papanicolaou—Amer. Journ. of Anat. 1917.
6. Allen E. and E. A. Doisy—Journ. Amer. Med. Assoc. 1923 —Physiol. Rev. 1927, Vol. 7.
7. Fraenkel, L.—Arch. f. Gynakal, 1910.
8. Loeb, L., and W. R. Kountz. Am. Journ. of Physiol., 84.
9. Steinach and Holzknecht—Arch. f. Entwick Mech., 1916.
10. Parkes, A. S.—Proc. Roy., Soc. B., 1926.
11. Allen—Anat. Rec., 33. 1926.

Radiotherapy in Carcinoma of the Uterus.

J. J. WEBER, B.A., 3T0.

It is only in recent years that radiotherapeutic methods have been used in the treatment of malignant disease. When it was originally found that malignant tumors decreased in size, and even disappeared entirely if treated by such methods, it was thought by many that the cure of cancer had been found. Later, however, when it was found that patients who had had local treatment by these methods died with recurrences at the local site, or with more distant metastastes, the opinion veered to the opposite extreme, and people lost faith in all radiological procedures before the subect had been fully investigated, or new variations in technique had been tried. Although radiotherapy is still in its infancy, the results obtained have been so striking, in both palliative and curative effects, that it would be an enormous mistake to abandon such treatment. Indeed, it is becoming more and more evident that, with improved technique, irradiation will probably supplant radical operative procedures even in early cases of carcinoma of the cervix, and in many American and European clinics this has already taken place.

Another factor which has tended to bring radiotherapy into disrepute is the haphazard way in which radium has been used. Many medical men look

upon it as an agent which has only one method of application, the dosage being indefinite and unimportant. Moreover, the value of the treatment is gauged entirely by the number of years the patients survive following irradiation, and the palliative effect has been lost sight of. Radiotherapy is, to say the least, the most valuable palliative measure we have in the treatment of inoperable cancers of the uterus.

With these few introductory remarks, the surgical treatment of uterine carcinomata will be discussed briefly before considering the radiotheropeutic procedures in some detail.

SURGICAL TREATMENT OF UTERINE CANCER.

A—In the body of the uterus.

The operative procedure here is complete removal of the uterus, tubes and ovaries, without widespread dissection of the cellular tissue. This form of treatment has so far yielded the best results, but, with further improvement in the technique of irradiation, it will probably supplant surgery entirely. Surgical procedures may be preceded or followed by deep X-ray therapy, as will be described later.

B—In the cervix uteri.

Schmitz has classified cervical cancer into the following clinical groups:

1. Where it is clearly localized to the cervix.
2. Where there is doubt as to localization to the cervix.
3. Where there is infiltration and thickening of the cervix and contiguous tissues.
4. Advanced case with large necrotic ulcers and widespread involvement of the surrounding tissues.
5. Local recurrences following previous therapy.

The first two groups constitute the so-called operable cases, and some authors believe that in these operation is the treatment of choice. However, as our knowledge of irradiation therapy advances, surgical procedures are gradually fading out of the picture. Surgery followed by irradiation is still considered to be a rational form of therapy in these early cases.

The first surgical procedure was that of radical abdominal hysterectomy as described by Rees and Clark. This operation was modified by Wertheim, and his procedure, in addition to the radical hysterectomy, included widespread dissection of the cellular tissue, including as much as possible of the regional lymphatic tissue.

Wertheim's operation is technically very difficult, and requires a great deal of surgical skill. With it, however, Von Franque has been able to obtain five-year cures in 80% of the cases which were in the operable group; in contrast with this, Von Seuffert reports five-year cures in 80% of operable cases treated by irradiation. Moreover, the primary operative mortality is about 14%, even in the hands of experienced surgeons. To illustrate this point, let me quote figures by Martzloff. In his series of 387 cases applying for operation, 46% per cent. were found to be operable, and in these he had a primary mortality of 14%, with only 27% of cures for five years or more.

From results such as these, it is reasonable to expect that in time surgery will be almost wholly superseded by radiotherapy, in which the primary operative mortality is low, the period of hospitalization is much shorter, and, in the hands of competent workers, the results in all cases are equally good, if not better, than the results obtained by operative procedures.

We turn now to a discussion of radiotherapy, and will commence with a brief study of the pathology and action of X-rays and radium on normal and malignant tissues.

PATHOLOGY AND ACTION OF X-RAYS AND RADIUM.

The action of these physical agents varies greatly under different condi-

tions, and is influenced by many factors, some of which are known, others being as yet undetermined. It might be well to state here that although the mechanism of their fundamental action is still unknown, many of the results of their action have been determined.

Regarding the effects of irradiation on micro-organisms, Chamkers and Russ have shown that cultures of staphylococci, streptococci, etc., can be sterilized by these agents, but the dosage required is so large, that this effect of irradiation can be practically neglec- in the study of these agents when used in therapeutic doses.

Colwell and Russ, in their monograph, and others, have given considerable attention to the action of radium and X-rays on normal and malignant tissues, and a brief review of this work will not be amiss.

Skin:—

It is on the skin effect that the dosage of these agents is based. Four degrees of reaction are usually described:

1. Simple erythema.
2. Erythema with degeneration of the skin.
3. Vesication and superficial ulceration.
4. Deep ulceration.

The skin reaction usually appears in 10-14 days, and disappears slowly, but in some cases it may be followed by a secondary reaction in one or two months.

The healing of ulcers produced by irradiation takes considerable time and may be followed later by malignant changes in the skin area which was irradiated.

Blood and Blood Vessels:

At first there is a temporary increase in red and white blood cells, followed later by a decrease in both these blood elements. Prolonged irradiation may cause degenerative changes in the bone marrow, with resultant cachexia and fatal aplastic anemia.

The commonest change in the vessels is a swelling and proliferation of the endothelium, terminating in many cases with thrombosis and obliteration of the vascular channel, and necrosis of the area supplied by the obliterated vessel.

Muscle:

Laccasagne has shown that both voluntary and involuntary muscle tissue are relatively resistent to irradiation, but prolonged exposure will usually cause degeneration of these tissues with subsequent replacement by fibrosis.

Nervous Tissue:

Horsley and Finge have shown that this tissue is, per se, relatively unsusceptible to irradiation. They state that the changes produced in nervous tissue are secondary to the vascular changes produced by irradiation.

Horowitz, however, demonstrated a diminution of chromatin in the nerve cells associated with a thickening of the nerve fibres in the area which had been irradiated. He finds that small doses produce localized necrotic areas surrounded by inflammatory zones which would eventually heal. Ewing states tthat larger doses cause marked degeneration of the nervous tissue, which in many cases terminated fatally.

Uterus and Ovary:

A dose of twelve hundred milligram-hours of radium within the uterus will usually check any bleeding almost immediately, but occasionally the bleeding may persist for some weeks before amenorrhea develops. The amenorrhea produced is usually permanent, and in many cases is followed by the symptoms of artificial menopause that are known to follow some cases of bilateral oophorectomy. Let us now briefly consider the cause of the amenorrhea brought about by thtis dose of radium within the uterus.

In the uterus itself, due to irradiation, local macroscopic and microscopic changes are produced. There is a localized sloughing area, which may extend

into the proximal muscle layers, especially if the irradiation has been preceeded by curettage. The necrotic area is surrounded by an inflammatory zone in which exudation and cellular infiltration is present. Localized vascular changes, similar in nature to an obliterating intimal sclerosis, are found in the areas which had previously been irradiated. After separation of the slough, healing of the ulcer tends to occur, but the process is quite slow, and may, if the ulcer is very deep, terminate in marked scarring of the endometrium. In many cases of amenorrhea following radium administration, where the uterus has been subsequently removed, no gross or microscopic changes of such a nature or extent to adequately explain the amenorrhea have been found. From this it appears that we must look elsewhere than in the uterus for the cause of the cessation of bleeding that frequently follows irradiation within this organ.

Let us consider next the effect of radium on the ovary as a possible cause of the amenorrhea. In 1913 Haendly reported the destruction of all the primordial follicles in ovaries removed some time after intra uterine irradiation. Insdike states that strong doses of radium or X-rays applied directly to the ovaries of rabbits will produce complete destruction of all the follicles. The same worker has shown that smaller doses will in time also cause atrophy and degeneration of all the follicles.

Matthews found the ovaries of mature animals to be more sensitive to irradiation than those of younger animals. From this he concluded that more active tissues were more sensitive to the action of radium and X-rays.

Various authors have described a stimulating action of irradiation on the ovaries; but Geller and others could not obtain evidence for such a view, even with carefully controlled experiments in which minimal doses were used. Budl, moreover, has shown that previously irradiated ovaries used as transplants are doomed to certain and rapid destruction.

In patients, Clarke and Norris have observed the absence of follicles in ovaries removed sometime after irradiation; moreover, an autopsy in patients with uterine carcinoma, treated by irradiation examination of the ovaries, shows the absence of follicles and the presence of scarring and atrophy of the ovarian tissue. In the latter case, however, the results might be objected to on grounds that the patients may have already passed the menopause.

Further evidence that irradiation produces amenorrhea by destroying the ovarian tissue is the observation that in those cases in which amenorrhea did not occur, and in which oophorectomp was subsequently performed, active Graafian and primordial follicles were present.

The evidence for the view that irradiation produces amenorrhea, not by its effect on the uterus, but by causing ovarian degeneration, is, then, briefly as follows:—

1. The lack of sufficient pathological change in the uterus to account for the cessation of bleeding.
2. When the amenorrhea is complete and permanent no active follicles have been found in the ovaries; but where it is incomplete, active follicles can be found in these structures.
3. In many cases of permanent amenorrhea brought about by irradiation, symptoms of artificial menopause similar to those following bilateral oophorectomy are present, thus indicating ovarian destruction.

Malignant Tissue:

Clinically and experimentally, radium and X-rays will destroy all forms of malignant tissue if the technique of application is perfect. The inability to give a lethal does to all the cells of a given tumour will easily ex-

plain the failure to secure absolute destruction of the growth.

Bergonie and Tribondeau, after careful histological study of various types of tumours and the effect of irradiation on them, formulated the following law: "Immature cells and those in an active stage of division, are more sensitive to irradiation than those cells that have already acquired their fixed adult morphologic and physiologic characters."

On the basis that malignancy is characterized by the extent of undifferentiation of the cells, the number of mitotic figures, and the rate of growth of the tumour, Ewing and others have attempted to formulate the degree of radio-sensitivity of the tumour.

Kimbrough found that tumours having a preponderance of embryonal cells responded to irradiation as far as local healing was concerned in 76% of cases, whereas tumours made up of more mature cells healed locally in only 51% of the cases. He also observed that, as far as end results were concerned, little difference was obtained owing to the more rapid growth and more widespread lesions that occur in tumours made up of rapidly proliferating immature types of cells.

Martzloff made a study of the various types of carcinoma of the cervix in relation to their degree of malignancy. He found the order of malignancy to be as follows:—

1. Transitional-cell type is the most malignant.
2. Adenocarcinoma is next in order of malignancy.
3. Prickle-cell type is the least malignant.

Irradiation of a cancer shows its first effects by the production of an inflammatory lesion. The nuclei of the malignant cells become swollen; then they fragment and degenerate. The cytoplasm swells and becomes vacuolated. Mitotic cells are especially susceptible, and cell division ceases soon after irradiation is commenced. The chromosomes split, the spindle threads degenerate, and the cyloplasm is destroyed. During this stage of action the stroma is oedematous and hyperemic, and later it also undergoes degenerative changes.

After a short time leucocytic infiltration occurs, new thick-walled vessels appear, and fibroblasts proliferate. Most of the chromatin of the malignant cells is absorbed by the leucocytes, but some remains in the interstices of the proliferating connective tissue; due to pressure, the remaining chromatin particles assume irregular shapes and simulate at times giant cells—the so-called irradiation giant cells.

The mechanism by which irradiation produces these cellular changes is as yet undetermined. Ewing states that the cell constituents are ionized, and that the intracellular ferments are activated by the irradiation to such an extent that reaction readily occurs. This favours the view that the reaction to irradiation is specific—a view that is not held by all workers. From a study of the histological changes brought about by irradiation, Ewing and others believe the effect is produced by a specific and selective action of radium on neoplastic tissue. Whether or not the primary action is on the nucleus or the cyloplasm of the cells is still a debatable question; but all workers agree that neoplastic cells undergo early solution, and that ultimately both the nucleus and the cyloplasm is destroyed.

Wood and others believe that irradiation in small doses stimulates malignant cells to an increased rate of growth. Hertwig, Ewing, et al., have shown that even minimal doses of irradiation inhibit mitosis, and on this basis they refute Wood's theory. Nevertheless, this question of stimulation to increased activity by small doses is still an open one.

When successfully irradiated malignant tissue is eventually replaced by fibrous tissue, and even though all the cells are not destroyed, the growth of

connective tissue may act at least as a temporary barrier against further spread of the growth. Nevertheless, following irradiation, some tumours are more rapidly disseminated, probably due to their low radio-sensitivity combined with the trauma incident to the treatment. Moreover, previous ill-advised radiation therapy resulting in a lowered radio-sensitivity, might be a factor in many of the cases of increased growth subsequent to the radiotherapy.

From this brief consideration of the action of irradiation on normal and malignant tissues, it will be readily understood that the problem of radiotherapy is to determine the most efficacious methods of application of radium or X-rays, whichever one decides to use, since it is quite clear that both these agents will destroy neoplastic cells.

We will now consider, in a very broad way, the various means of employing X-rays and radium in the treatment of carcinomata of the uterus.

METHODS OF EMPLOYING X-RAYS.

From the clinical point of view of treatment, carcinoma of the cervix may be divided into—

A—Primary (i) Operable.
(ii) Borderline.
(iii) Inoperable.
B—Operation combined with radiation.
C—Recurrences.
D—Combinations with radium.

Technically X-rays may be administered by

1—Large fields.
2—Multiple small fields.
3—Combinations of 1 and 2.

In primary cases, which are by choice operable, and where operation is refused or inadvisable owing to the general condition of the patient, we find an area of cancer in the cervix which is freely mobile, with no evidence of infiltration. We must in all cases also treat the parametria. Large fields have been used, and irradiation has been carried out by cross-fire from in front, behind, and laterally, the surface dosage in each area varying with the fat content of the patient. In very stout patients a perineal field is also employed, or a combination of X-rays on the surface and radium to the cervix.

To-day large fields are usually only employed as prophylaxis following surgical or radium treatment.

The multiple small field concentration method has been described by Sietz and Wintz. In this technique six fields, each 6 x 8 cm., are used.. Three are applied anteriorly and three posteriorly. These are concentrated on an accurately located cervix, and, depending on the thickness of the patient, the dosage is regulated so that the cervix receives 120-175% of the minimal skin erythema dose. In very stout patients perineal and vulvar fields are also used. After 1½ or 2 months, allowing for a return to normal of the skin and blood of the patient, the right or left parametrium, depending on which appears to be most involved, is also irradiated by the six fields, and after another similar time lapse, the other parametrium is also irradiated. With this method Wintz reports five-year cures as follows:

66% in the operable group.
12% of the inoperable group.

In order to avoid overdosing some fields and underdosing others, the greatest anatomical consideration of the location of the fields and careful dose adjustment is essential, and this requires the co-operation of a competent radiologist.

Borderline and inoperable cases must be considered together, since they vary in severity, and the fixation in early cases may be due to inflammatory changes and not to carcinomatous infiltration; nevertheless, treatment must be given as though the latter were the case.

When the upper vgina is involved, or where there are small operable recurrences following a Wertheim operation,

the small field method is useful. But with signs of recurrence soon after operation, the large field method has given better results than the concentration method.

With advanced primary cases, or where secondary deposits or cachexia is present, one must not overtreat. The only treatment here is palliative in nature to relieve bleeding and pain, and, if possible, to prevent further spread of the growth. These cases are usually hopeless, and a combination of X-rays and radium is frequently more beneficial than either agent alone.

In the large field methods, the applicators are 10 x 15 centimeters in measurement. They may be employed in combination with small fields, one to the vulva and one to the perineum. Less dosage is given posteriorly than anteriorly, since the patient in bed is on her back, and is more liable to bed-sores on the irradiated area than on normal skin.

In every case, before treatment is commenced, the following points must be carefully determined:

1. Palpable and probable extent of the lesion.
2. The various diameters of the patient with and without abdominal compression.
3. Anatomical position of the cervix, noting whether or not it is deflected to either side.

Then, with tables of depth intensity for the instrument to be used, a technique that will give a fairly uniform radiation to the tumour and to the neighbouring lympatic structures should be devised.

Before irradiation some workers advise preliminary diathermy, or conization of the cervix, with copper or zinc, in order to render the growth more susceptible to irradiation. Moreover, the patient must be carefully prepared for several days previous to irradiation. Non-metalic vaginal douches are used to cleanse the vagina and cervix in an attempt to minimize secondary infection as much as possible. No metallic drugs should be given, and the bowels should be empty. No food should be given for at least two hours previous to irradiation.

Patients liable to radiation sickness should be given sodium bicarbonate or calcium lactate, and they should be watched carefully during the treatment.

One treatment should be given in at least seven to ten days, and, with one course of treatment, one should attempt to cause regression of the growth, since it is usually found that, following two or more treatments, no further benefit is derived.

In favorable cases, after one or two treatments, the cervix becomes smaller and more mobile; the parametria are less thickened; and pain, discharge and bleeding are usually lessened. The patient puts on weight and looks and feels in better health.

X-rays and Operation.

This agent is more commonly used following operation than before, although several workers (Meyer et al) advise pre-operative radiation, because

1. Post-operative peritonitis is lessened by over 50% in septic cases.
2. Some inoperable cases have been rendered operable.
3. There is less risk of dissemination of the growth at operation, and thus recurrences are minimized.

Warnekross gives results to show the value of post-operative irradiation. In his series of 190 cases, recurrences were twice as frequent in cases not having post-operative X-ray treatment.

The methods used in combination with operation are as elsewhere, large fields, small fields, or combinations of large and small fields.

Siegel recommends following up these cases with monthly examinations in order to diagnose recurrences as soon as possible, because it is found that they are then more susceptible to the influence of irradiation.

COMBINATION WITH RADIUM.

This is a useful procedure, especially in stout patients, but it has been abandoned in many clinics owing to the diffi-

culty of determining accurately the combined dosage. Thus the risk of overdosing some areas is present, and may lead to ill effects, such as damage to the bladder or rectum, with possible fistula formation.

When used, a period of three weeks is allowed between the radium and X-ray applications in order to give the patient a chance to return to a more normay physical state.

X-RAY IN TREATMENT OF CANCER OF THE BODY OF THE UTERUS.

In carcinoma of the body of the uterus, operation is the treatment of choice, and, indeed, many cases are not definitely diagnosed as cancer before operation.

When operation is refused or deemed inadvisable, X-ray is of value. The methods are as previously described, but the chief value of deep X-ray therapy in carcinoma of the body of the uterus is in the post-operative treatment, in an attempt to destroy any cancer cells left behind by operation, and thus to prevent recurrences in so far as it is possible.

RADIUM.

This element may be employed either in the form of emanation gas or the solid salt. Emanation gas loses about one-half of its strength in four days, whereas when the salt is used, the supply of gamma rays is more or less constant, since there is an equilibrium between all the degradation form of radium.

Radium sulphate is the most commonly used salt, since it has the advantage of having a low solubility co-efficient, which is important if the container should leak, allowing the entrance of liquids.

In treating cervical cancer, the more usual containers are iridium-platinum needles, having a wall thickness of 0.5 millimetres and a length of 40-60 m.m. They contain an equivalent of 2-5 mgms. of radium element.

Regarding the expression of dosage, it is usual to state it in terms of milligram-hours. That is the number of milligrams of radium employed, multiplied by the duration of application in hours. Some workers, however, express it in terms of the number of millicuries of emanation destroyed during the treatment. This is easily obtained by multiplying the dose in mgm.-hours by the factor 0.0075.

METHODS EMPLOYED.

In a general way there are two schools of technique, one advising external applications, the other burial of the radium close to and into the growth.

Those advocating external application do so because:

1. Introduction of needles may disseminate the growth.
2. Normal tissues injured by the passage of the needle may be unduly affected by the radium.
3. Normal tissues injured by the needle in its passage may allow or stimulate the growth of the tumour.
4. Sepsis may be introduced in the passage of the needle.

Those advising burial of the radium do not think that these objections are comparable to the advantages, such as greater intensity at the site of the lesion and more uniform irradiation of the whole mass obtained by burying the radium in the tumour . Moreover, less dosage is required with buried radium than by surface application, and thus there is less danger to the superficial tissues.

On this continent both methods are used, and, in addition, unfiltered "seeds" of emanation are also buried in the tumour in many cases. This latter procedure, of course, brings the beta rays into force, but these are generally conceded to do more harm than good.

Owing to the great variation in the methods of application, only a general description of them will be attempted.

Vaginal Treatment by Buried Needles.

In this method an attempt is made to distribute the radium evenly through-

out the tumour. Before treatment the patient is douched for two or three days previously with non-metallic douches in order to cleanse the vagina. Douches made up of solutions of metals leave some of their metallic content behind the gamma rays, on striking these give off beta particles, thus defeating the end for which the filters re employed. At the time of treatment the patient is anesthetized, and the radium needles are inserted in and around the growth, allowing about one-half cm. of tissue between each needle. The longer needles are pushed upwards and outwards into the broad ligaments. The vagina is then packed with gauze soaked in flavine.

Eight large needles, each 60 mm. long x 0.5 mm. wall thickness, containing 3 mg. of radium, and twelve or thirteen short needles each 40 mm. long x 0.5 mm. wall thickness, containing 2 mgm. of radium, are employed. This gives a total of 48-50 mgm. of radium, and as the needles are left in sitn for 144 hours, a dose of 2,200 mgm. hrs. is thus administered.

Vaginal Treatment by Surface Application.

The vagina is prepared as previously described. One or more tubes containing a total of 50 mgm. of radium is placed in the cervical canal. The tube should have a wall thickness equivalent to 0.5 mm. platinum, and around this cork or gum rubber filters may also be used. The duration of application is 72-144 hours, giving a dose of 3,600-7,200 mgm. hours—the larger dose being more efficacious than the smaller.

Extra-Abdominal Application.

This is used in some clinics in addition to other forms o fradium therapy. Large amounts of radium are required, the radium being employed at a distance of 5-10 cm. from the skin, which certainly lowers the intensity of action on the tumour, and may, moreover, burn the skin. Owing to these disadvantages, this form of application is not used today to any extent.

Intra-Abdominal Application.

In this method the radium is used either extra or intra-peritoneally, and is applied as closely as possible into and around the growth. The technical difficulties are very great, and little data regarding the results obtained is available at present. Dr. Richards, however, believes it is a method which will eventually be used quite frequently, and that it will give very good results.

Radium and X-ray combinations have been described previously.

Radium and Hysterectomy.

In this form of therapy the radium is a pre-operative measure. Fair results have been obtained at some clinics by this method of application of radium.

Other workers operate on early cases of carcinoma of the cervix, especially of the epithelioid variety, following the trachelectomy irradiation is used. Good results have been obtained by this technique.

Radium in Carcinoma of the Body of the Uterus.

Radium is being used to-day in many clinics in treating cancer of the body of the uterus, and so far the results appear to compare favourably with those obtained by operative procedures.

Let us now briefly consider some of the injurious effects produced by radium therapy.

Fistulae.

Faecal and urinary fistulae may be produced by the action of radium, especially if it is not used carefully. The incidence of fistula formation is, however, low, and might be considered as negligible, since it occurs terminally in many cases which have not received radium treatment. The incidence can be lowered by packing the vaginal wall around the site of application with gauze soaked in flavine, thus preventing contact of the applicators with the normal vaginal wall.

Burns.

Radium occasionally causes severe burns in the vagina close to the site of

its application. The incidence of burns in this region is lower than elsewhere, however, since the normal epithelium of the vagina and cervix has a low radiosensitivity.

Sepsis.

This is a real danger, and is introduced by the applicators, the organisms invading the tissue devitalized by the radium resulting occasionally in peritonitis or septicemia.

Sepsis can be minimized, however, by careful and thorough cleansing of the vagina for several days preceding irradiation, and by using aseptic precautions in handling and inserting the applicators. Moreover, in extensive foul ulcerating cases, it is probably better to use surface applications of radium in order to reduce the dangers of infection.

Stimulating Effect of Radium.

Whether or not radium stimulates the growth of malignant cells is still an open question, but it is quite possible that emaciated and cachectic patients undergo a further lowering of their general resistance by irradiation, and thus the tumour may grow, or appear to grow, more rapidly. By using large doses of radium little or no stimulating effect to the growth will be evident.

Dissemination of malignant cells by the use of radium needles buried in the tumour is advanced by those favouring surface applications, but it is hard to perceive how this could occur, since any malignant cells pushed along by the needle must eventually be destroyed by the radium which it contains.

Results of Radiotherapy.

Heyman at Stockholm has probably made the most careful study of the results of radiotherapy in treating carcinomata of the uterus. Of 505 cases treated by irradiation, he has 217 cases for 5-year studies. He obtained 5-year cures in 40% of 19 operable cases, and of 181 borderline and inoperable cases 17% were symptom free after five years. His immediate mortality was 1.2%.

Voltz in 1925 reported his results of

Sporting and Athletic Goods

New Spring and Summer Lines of

Golf, Tennis, Baseball, Outing and Camping Supplies

Brown's Sports & Cycle Company, Limited

345 Yonge St.

Phone Adel 8237.

Call In and Get Acquainted

No Obligation to Buy

Special Discount to Students

EXPERT workmanship applied to perfect cloth is the secret of long wear. Add clever cutting and you have a "Skitch-built" suit.

Hundreds of Students testify to the satisfaction of "Skitch-built" clothes

$35.00 to $60.00

Suits - Top-Coats - Tuxedos—Made to Measure

HARRY SKITCH CO., LIMITED

9 Adelaide Street East

755 cases. His results of five-year cures are as follows:—

110 operable cases—43.6% cures.
130 borderline cases—27% cures.
340 inoperable cases—6.7% cures.
169 hopeless cases—no cures.

Other workers show equally good recults, and it hardly seems necessary to burden this paper with more figures—they can be readily obtained in any monograph on the subject, or by reference to the original literature.

As a palliative measure, there is no question whatever that radiotherapy has already more than justified itself. As a curative agent it has been widely accepted in preference to the Wertheim operation. The symptoms of pain, hemorrhage and discharge cease within one or two weeks. The growth in the vagina disappears at the end of 5 or 6 weeks, and ulceration, if present, will heal in about the same time.

Owing to the inaccessibility of a great deal of the growth, life is not always prolonged, but many cases have survived the five-year period, and in this respect radium offers greater hope for favorable prognosis, especially when combined with early diagnosis, than any other available therapeutic procedure.

BIBLIOGRAPHY.

1. Norris & Clarke—monograph.
2. Russ & Colwell—Radium, X-rays and the living cell.
3. Bourne—Recent Advances in Obstetrics and Gynaecology.

References to other literature on the subject will be found in these monographs.

INDEX (Volume VII—1929-1930)

Acidosis and Alkalosis—T. Beath, 3T0 71
Address to the Graduating Class—Dr. H. B. Van Wyck 218
''Among Giants''—Miriam A. Brick, 3T0 99
Anaesthesia, Short Synopsis of the History of—Margaret K. Patterson, 3T0 211
Anaesthetics—V. E. Henderson 150
Appendicitis in Children—J. L. McDonald, M.B. 54
Arthritis—A. E. B. Perry, B.A., 3T0 ..... 201 and 233
Arterio-Venous Aneurysm—J. H. Forrester, 3T0 94
Bile, The Mechanism of the Flow of the—T. R. Sarjeant, B.A., 3T1 23
Boston Congress, The—F. Burns Plewes, M.A. 137
Breach of Contracts With Interne Hospitals 32
Breath Sounds, The Origin of the—D. A. MacFadyn, B.Sc., M.A., 3T1 38
Breech Deliveries—Frank J. O'Leary, M.B. 87
Carcinoma of the Uterus, Radiotherapy in—J. J. Weber, B.A., 3T0 240
Cyanosis of the New Born—W. A. Hawk, 3T0 9
Cyanosis of the New Born—Fraser M. Greig, M.D. 56
Decerebrate Rigidity and Its Clinical Aspects—W. A. Hawk 80
Delusions—A. A. Numbers, 3T0 90
Dermatology in Its Relation to Medicine— —E. J. Trow, M.B. 120
Differences in the Physiological Antagonisms of Ions—Albrecht Bethe, M.D., Ph.D. 176
Dyspnoea—C. B. Weld, M.A., M.D., 2T9 49
Eye Injuries—W. H. Lowry, M.D., C.M. 69
Fractures, The Treatment of Some of the Common—D. E. Gourlay, B.A., 3T0 164
Gall Bladder Disease—G. W. Miller, B.A., 3T0 113
Gastric and Duodenal Ulcers, Surgical Aspects of—H. W. Wookey, M.B., F.R.S.C. (Eng.). 227
Gastric Juice, The Secretion of—N. B. Taylor, M.B., F.R.S.C. 3
Hippocratic Oath, The—Bliss Macquarrie, 3T4 135
Hypertension, Essential, The Present Conception of—Arthur Stanley Granger, M.D. 183
Insulin and Surgery—J. C. Thomas, 3T1 43
Intestinal Obstruction, Acute: Clinical Features and Treatment—H. Paikin, 3T0 123
Intestinal Obstruction, Acute High, A Review of Experimental Work on—I. L. Chaikoff 130
Jaundice, The Differential Diagnosis of Clinical Conditions Accompanied by—Duncan Graham, M.B. 34
Knee Joint, Injuries to the—D. W. G. Murray, M.B., F.R.S.C. (Eng.). 222
Medical Progress in An Economic World—Ray Lyman Wilbur, M.D. 26
Muscle Contraction. The Analysis of a, Into Its Constituent Compounds—Albrecht Bethe, M.D., Ph.D. 145
Ovarian Harmones—S. J. Bochner, B.A., 3T2 236
Paget's Disease of the Nipple—Russell K. Magee, B.A., 3T0 194
Physio-Therapy or Treatment by Physical Agents—G. E. Richards, M.B. 103
Rheumatic Fever in Children, Some Observations on—George R. Pirie, M.D., M.R.C.P. 190
''Similia Similibus Curenter''—C. H. Gundry, 3T0 29
Sodium Amytal—W. A. Hawk, Med. 3T0 170
Syphilis, Shakespeare on 65
Tendon Sheath Infections—J. F. Curtis, 3T0 16
The Oldest Surgical Treatise—O. E. A. Stephens, 3T4 168
Thyroid Storms—C. A. Wicks, B.A., 3T0 154